

Geographic Extent of Effective Radar Precipitation Detection

David Kitzmiller, Dennis Miller, Wanru
Wu, Ziya Zhang, Nathan Patrick

National Water Center

July 15, 2015

Geographic Extent of Effective Radar Precipitation Detection

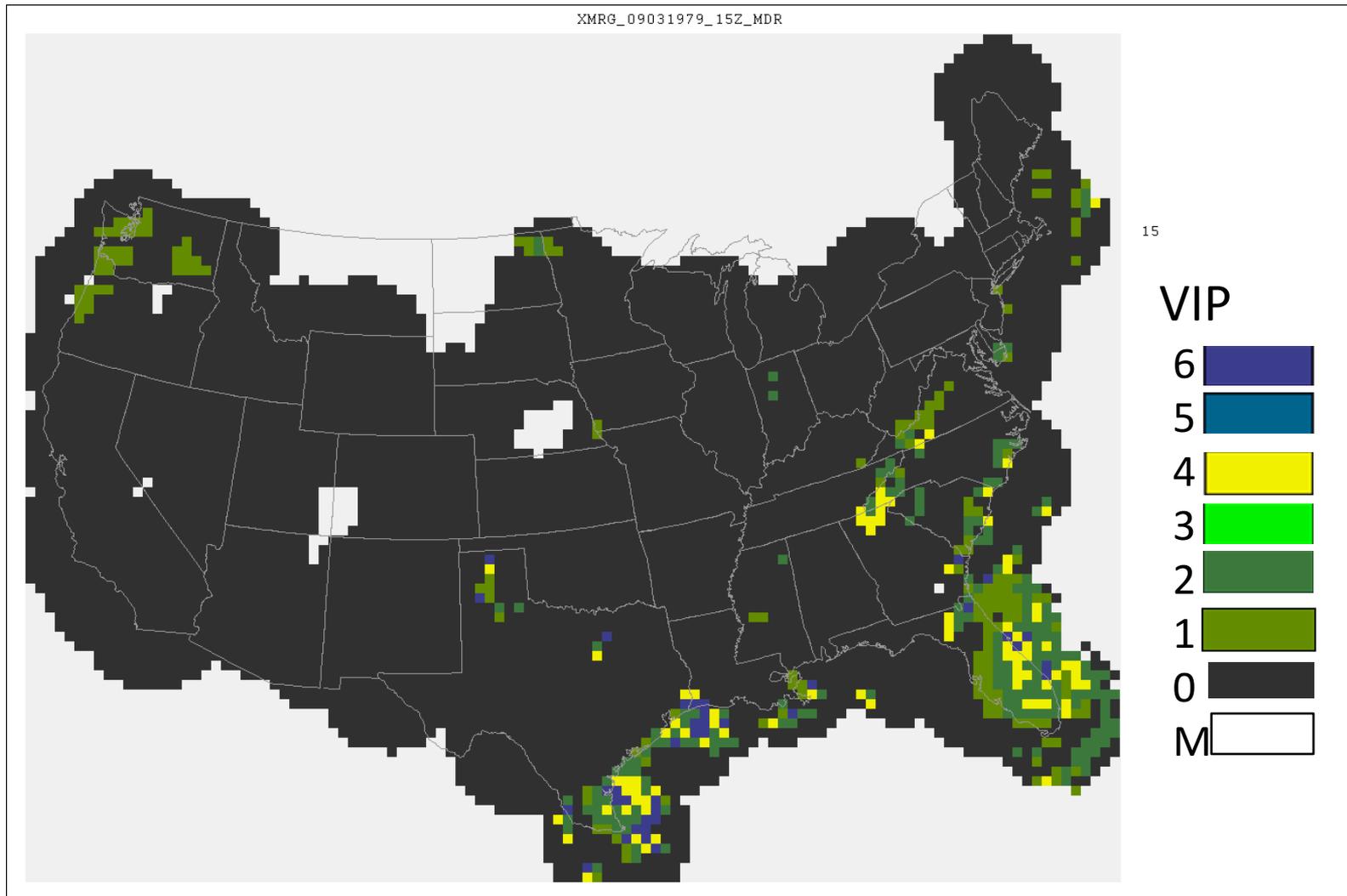
- Current applications like AWIPS MPE rely on 0/1 mask to outline areas of effective radar coverage
- Radar QPE is accepted within the mask
- Radar QPE is ignored outside the mask
- Seasonal dependence generally included
- To date, masks are subjectively defined
- ***Desire an objective, more flexible method of masking***

Potential Methods/Metrics

- We don't have many rain gauges for comparison
- NSSL Multi-Radar Multi-Sensor (MRMS) has radar quality field based on beam elevation, freezing level height
 - Has been related to QPE error but not detection
- Other possibilities:
 - Radar QPE correlation with gridded gauge-based analyses
 - Radar QPE precip *relative frequency* compared to *climatology*
- Application below is for pre-NEXRAD Manually-Digitized Radar (MDR) data

Manually-Digitized Radar (MDR)

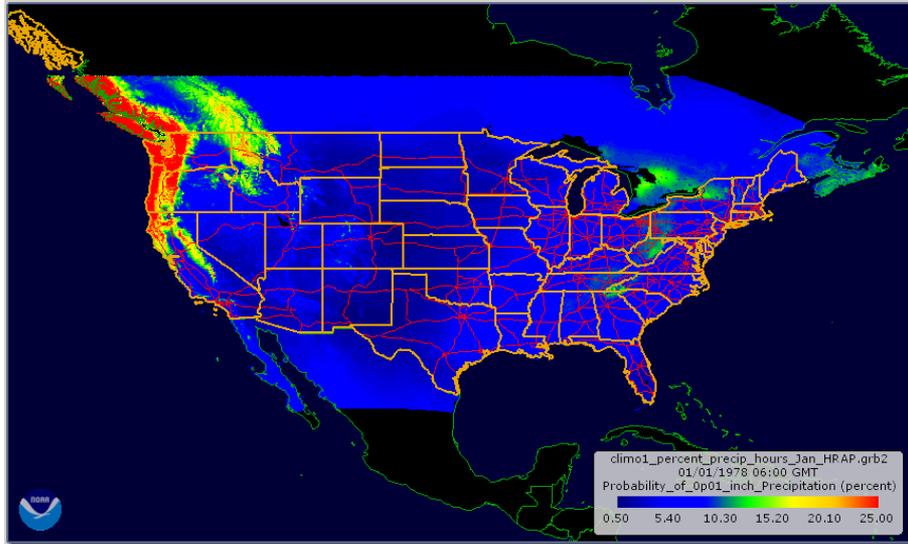
15-03 UTC, 3-4 Sept 1979



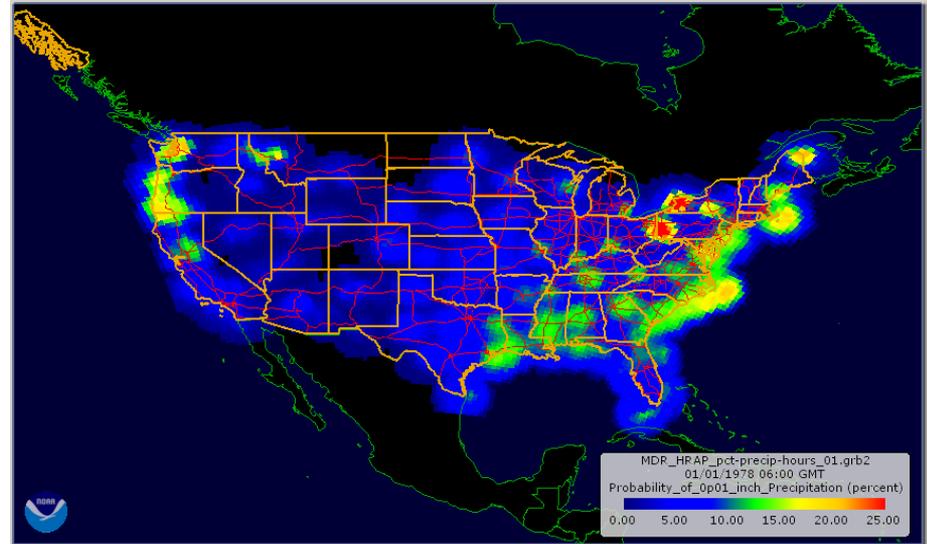
Manually-Digitized Radar Reflectivity

- Collected from 1960's through 1994
- From WSR-57 and WSR-74 sites
- Derived by inspection of Digital Video-Integrator and Processor (DVIP) display relative to 40-km map grids
- Local grids submitted 1x per hour, along with text descriptions, via teletype
- Archived by NWS Techniques Development Laboratory, available from NCAR
- ***We will use MDR solely to disaggregate daily precip obs to hourly, not for direct QPE estimation***

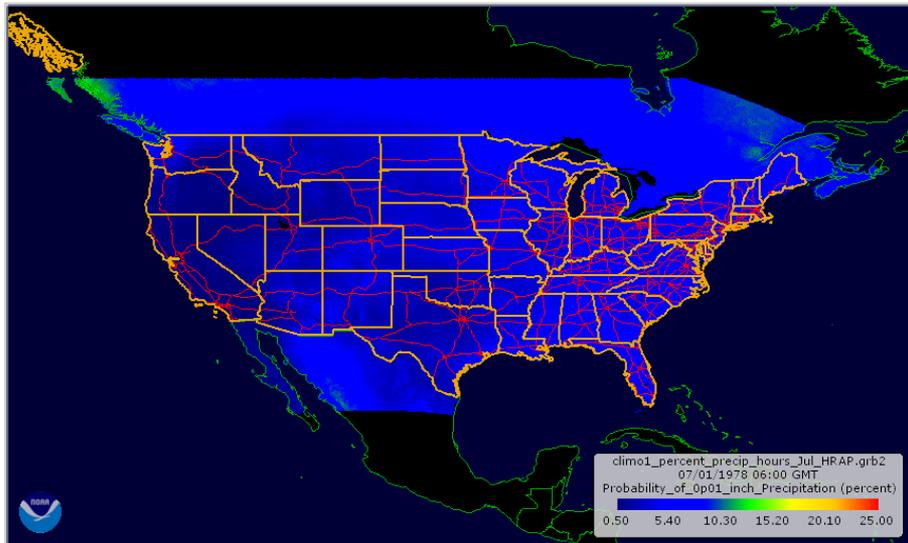
% hours with observed precip: January



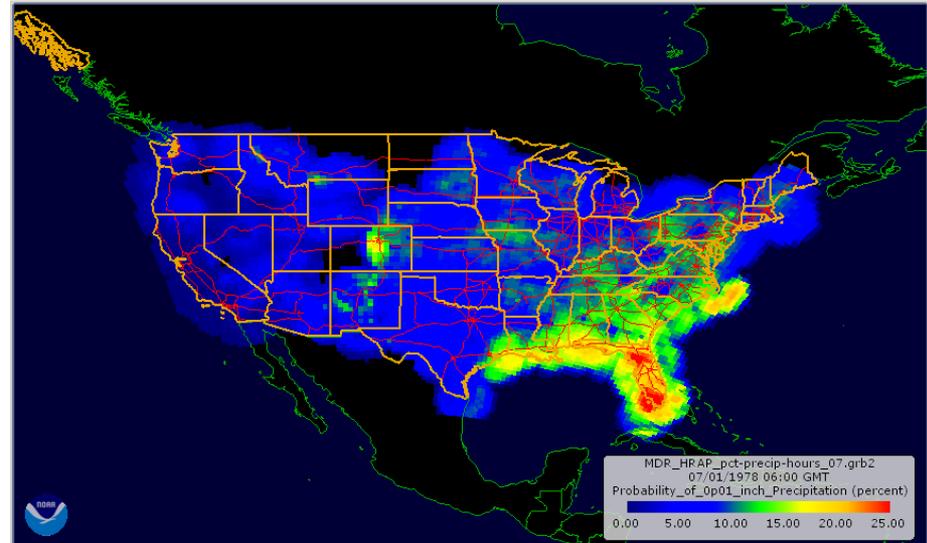
% hours with MDR VIP > 0: January



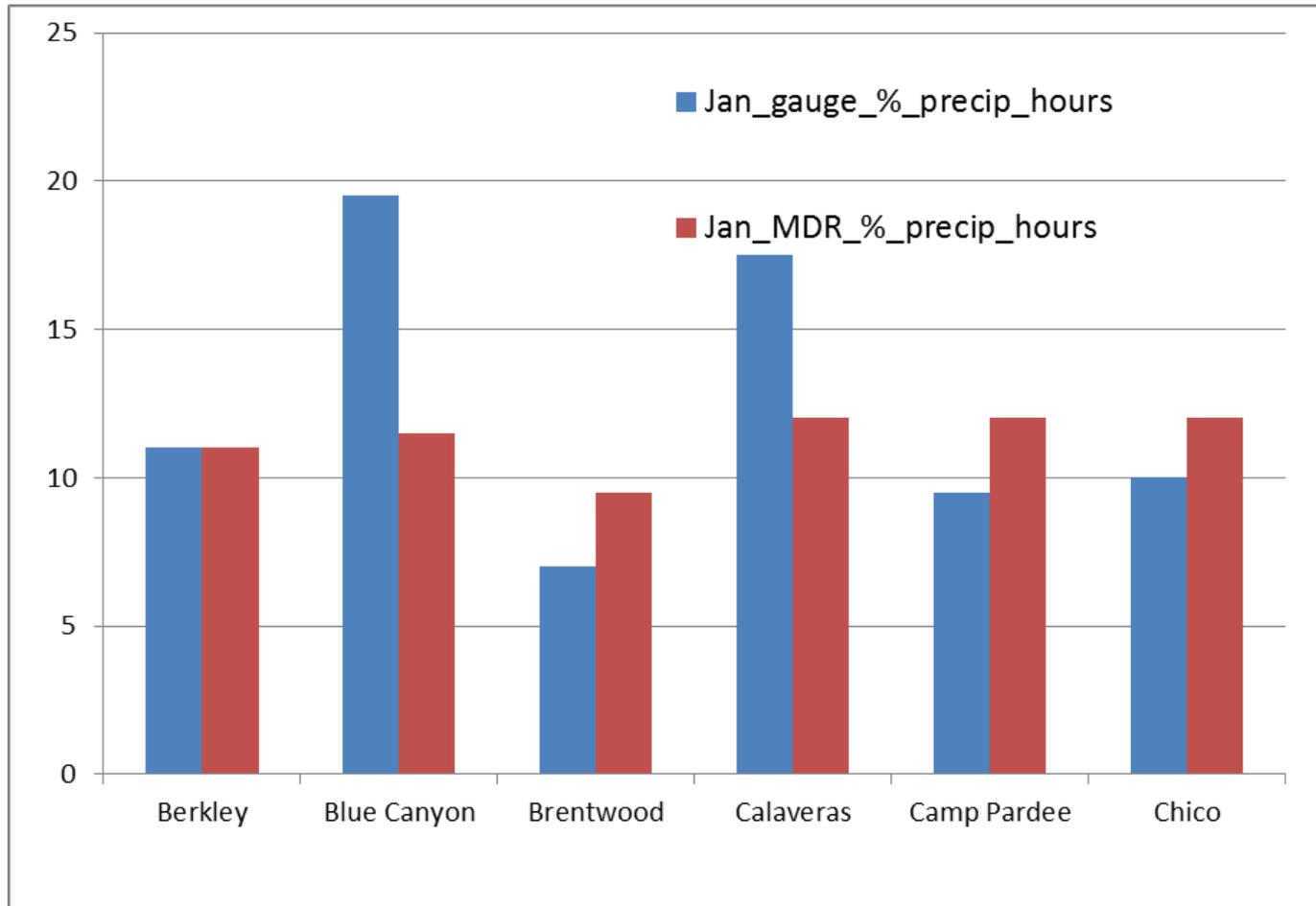
% hours with observed precip: July



% hours with MDR VIP > 0: July



Gauge- and MDR-based % precipitation hours January – California Sites



Radar detected only a fraction of precipitation at Blue Canyon and Calaveras

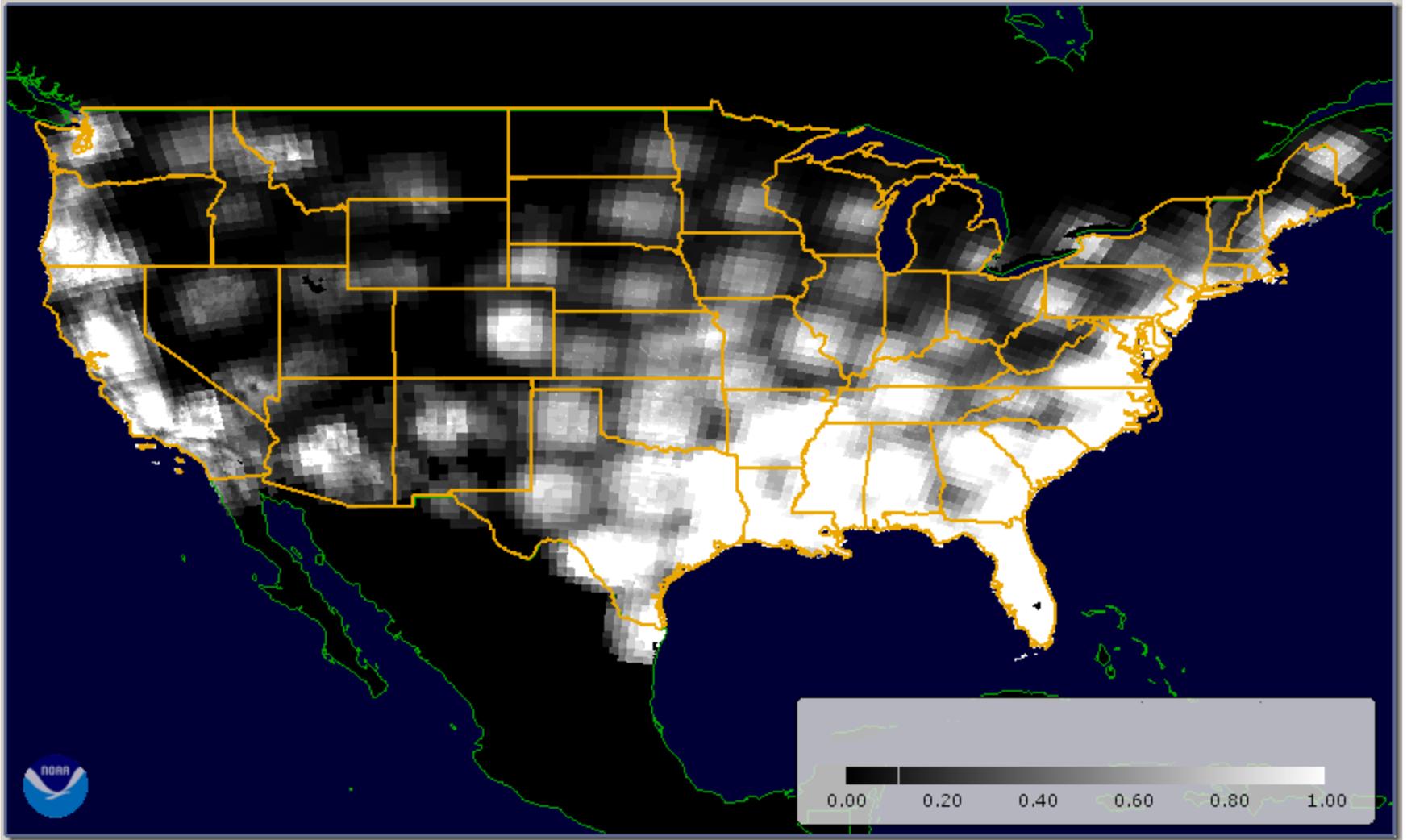
Ratios of % precipitation hours

- Figures below show:

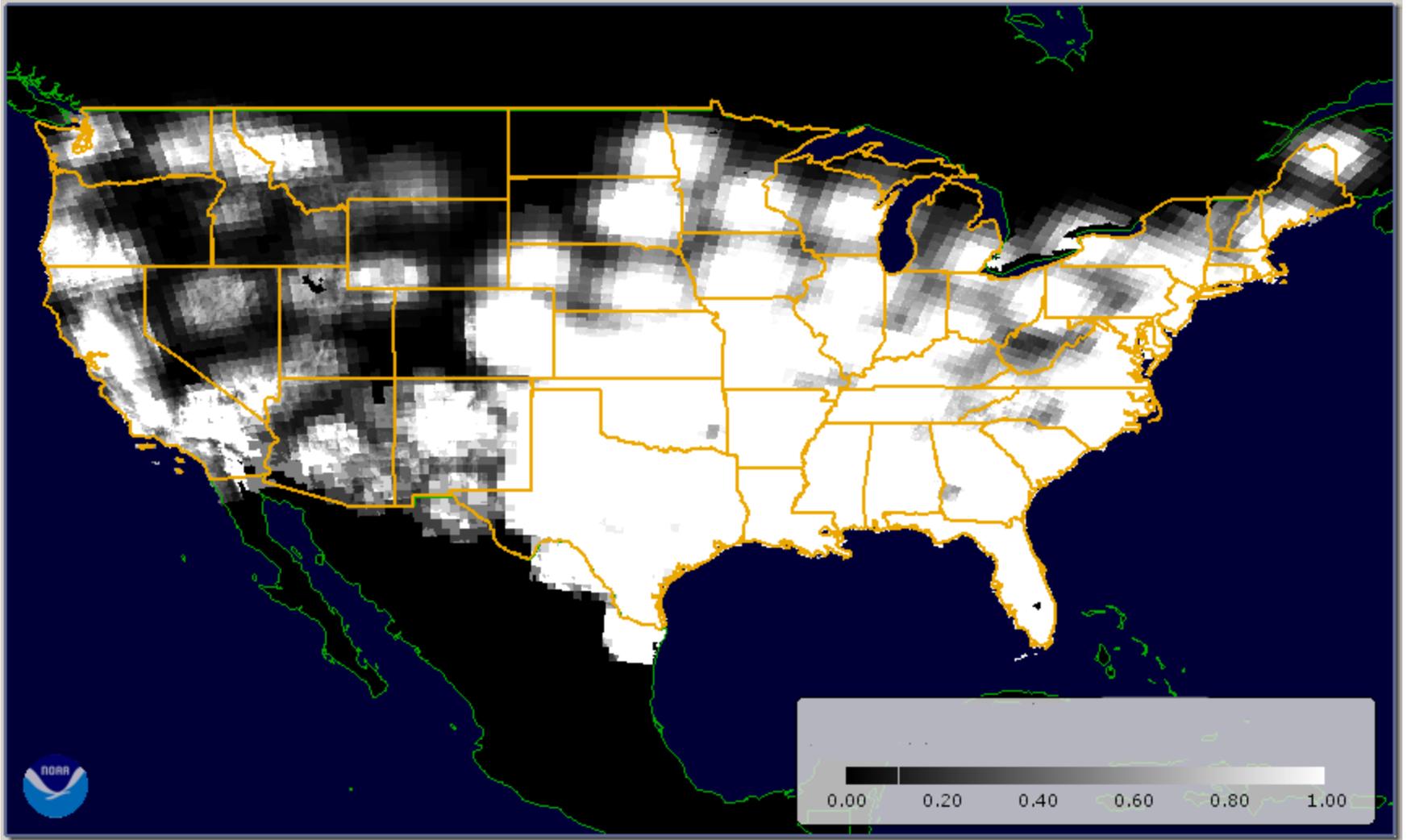
$$\Sigma (\text{Hours VIP} > 0) / \Sigma (\text{Hours obs. Precip})$$

- Data collected 1978-1994
- All available days, 0000,0300, ..., 2100 UTC
- Remember WSR-57/WSR-74 radar sites were different from WSR-88D
- Ratios are often > 1 due to 1600 km² radar sampling

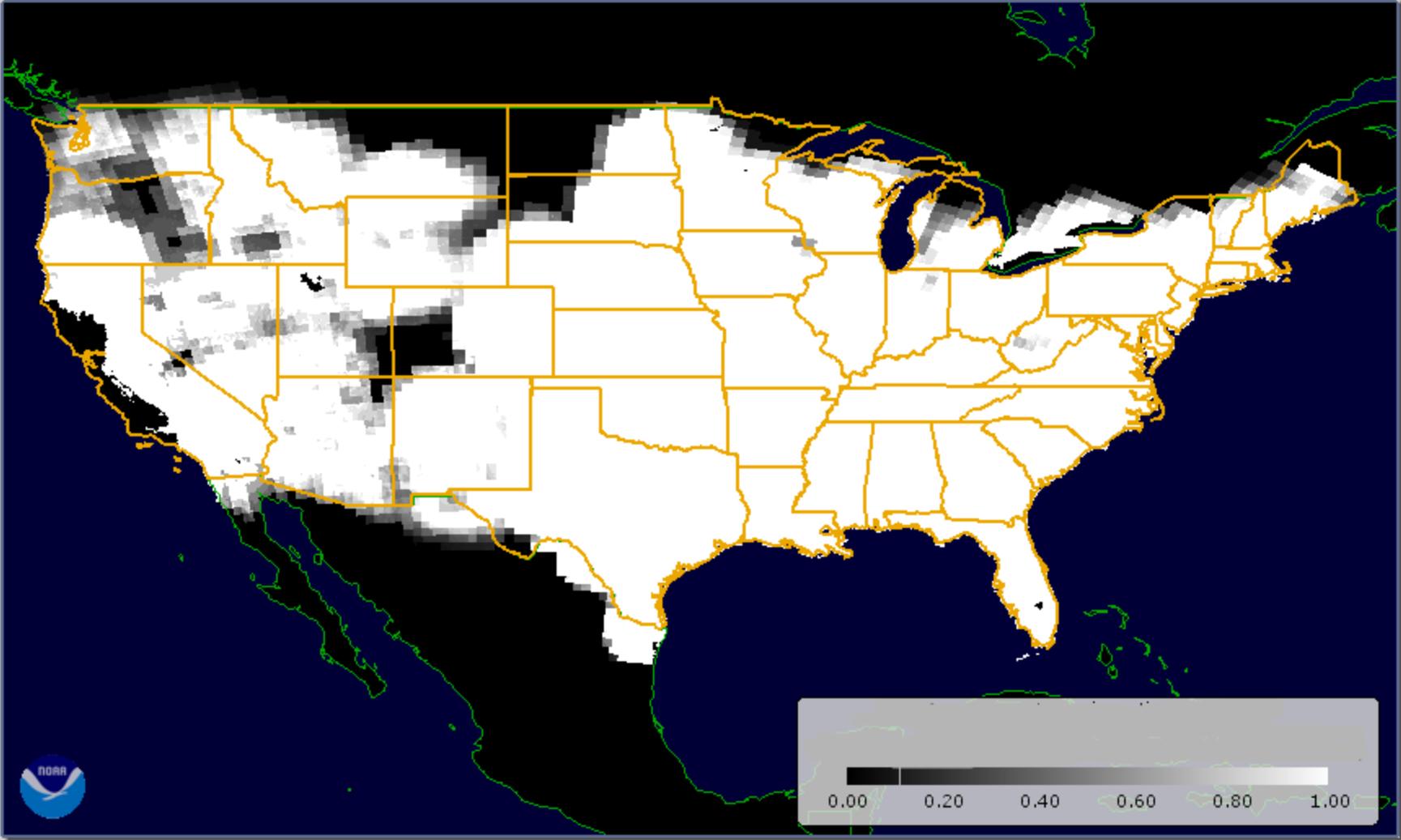
January



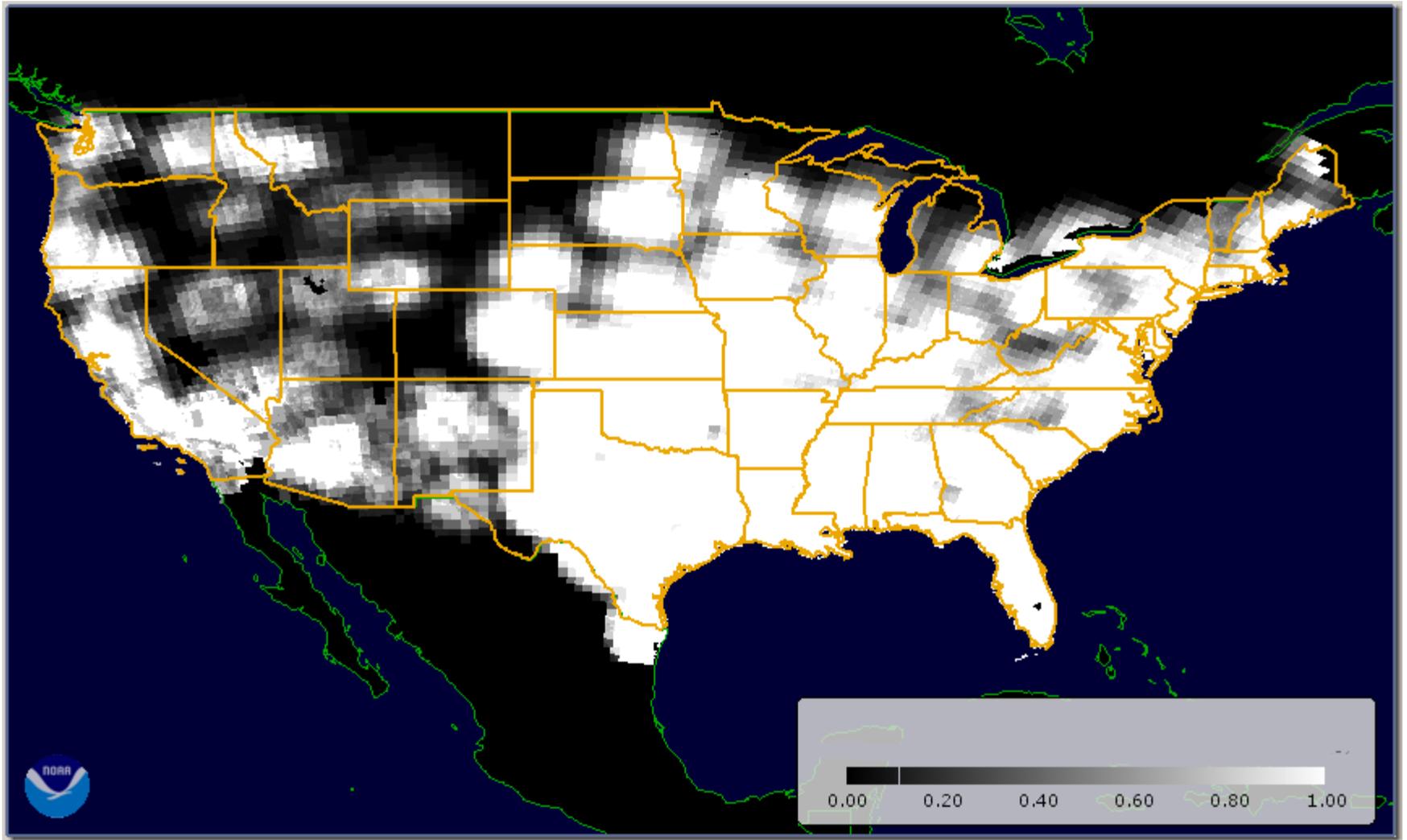
April



July



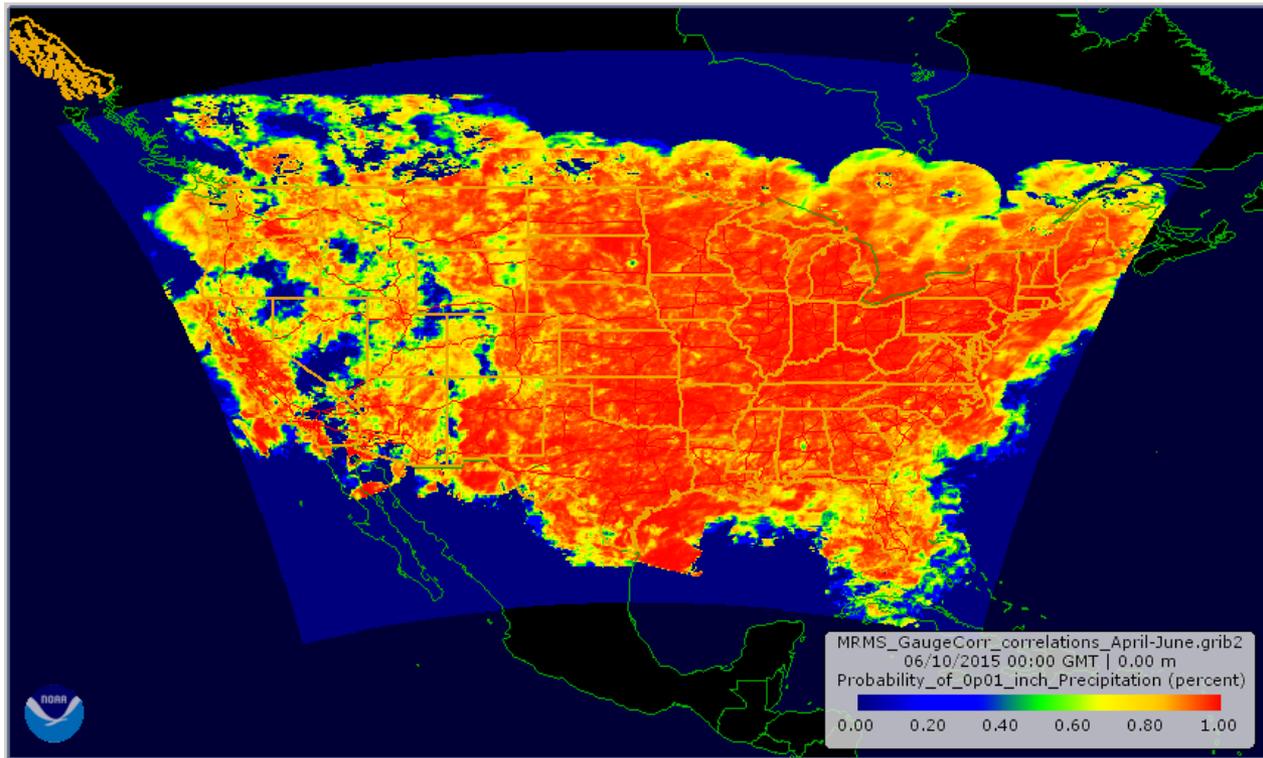
October



Proposed Application for Multi-Sensor Analysis

- Current AWIPS MPE and some other applications use simple 0/1 radar mask
- Propose to flexible mask:
 - If MDR/precip ratio > 0.8 , accept radar QPE as is
 - Otherwise:
 - If MDR > 0 , accept as precip
 - If MDR = 0, treat as missing
- MDR results shown at EWRI/WRAH conference 2014, submitted to J. Hydrology 2015
- Work is ongoing to define coverage for Stagell, MRMS QPE

Questions/Comments?



Correlation between MRMS Gauge-Corrected 24h
QPE and StageIV/CMC 24h gauge-multisensor QPE
April-June 2015